Reconciling Tradition and Innovation

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Power Marketing Conference

July 30, 2001

Portland, Oregon

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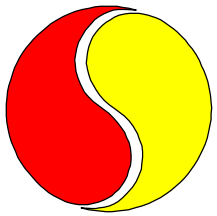
Remarkable Century

Major Forces and Utilities

Governance	-	Competition Market Based Approach Individual Choice
Environment	-	Sustainability Impacts - Local/Global
Technology	-	Smaller, Modular, Flexible Information Content Manufactured Energy

SUSTAINABLE ENERGY

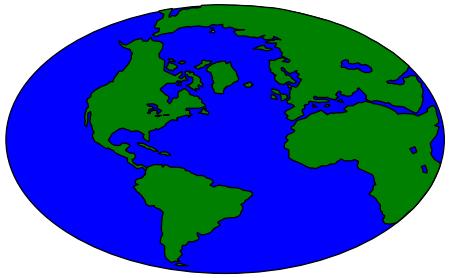


Must Move Closer to the Near Term Flux of the Sun

Heat of the Earth or the Pull of Gravity

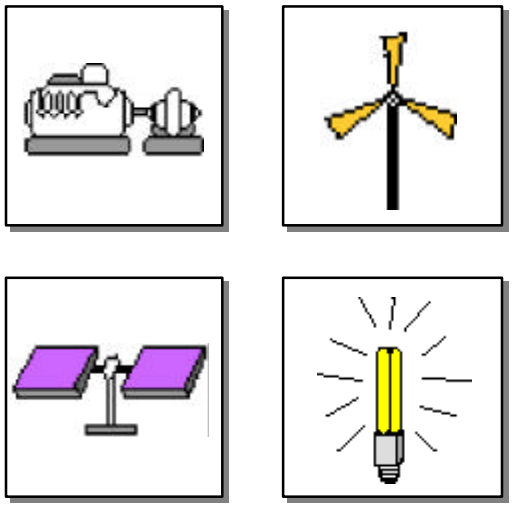
- **ONLY THREE WAYS TO GO**
  - **High Efficiency Conversion of "clean" fuels or sequester C02**
  - **Renewables**
  - **Energy Efficiency**

- **No Silver Bullet only Silver Buckshot**



Where Does Green Come In

It is Modular Big and Modular Small



Equal access

$$\$ = f\,(\pm G,\ S,\ T,\ D,\ \pm g, s)$$

Big **Small**

Green Innovation

Good at developing the Technology

Poor at employing the Technology

It doesn’t fit the mold

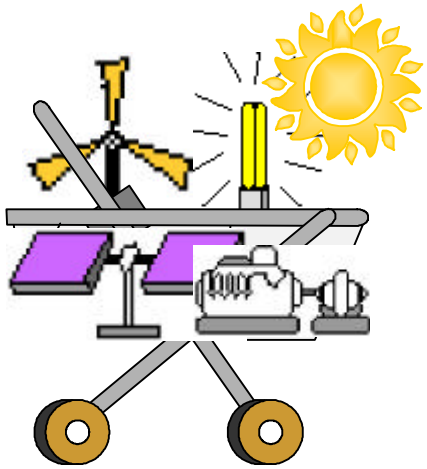
Radical or Disruptive Technologies

- **DISPATCHED BY NATURE, SELF, OR LOCALLY**
- **MODULAR, GEOGRAPHICALLY DISTRIBUTED**
- **NOT SUBJECT TO FOSSIL FUEL PRICE RISK**

Organizations good at traditional technologies do not survive a shift to Radical or Disruptive technologies

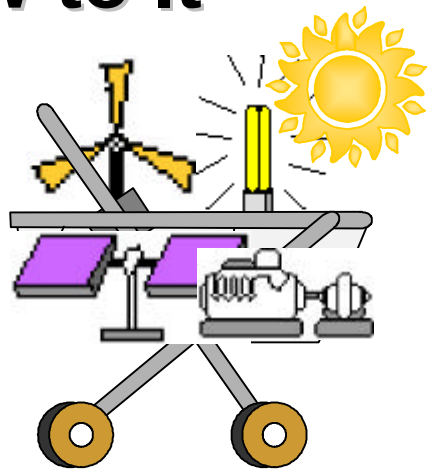
Require New Organizational Structures and New Operating Rules

General Methods for Speeding Innovation



Create the Market —

Let Capital Flow to It



Create the Capital —

Buy from the Market

General Methods for Speeding Innovation

Create the Market

Renewable Portfolio Standard
Standard Offer Contracts
Electricity Feed Laws
Efficiency Standards
Tags/Green Market Certificates
Wind Development Concessions
Fuel Price Risk Avoidance Standards

Create the Capital

Non Fossil Fuel Obligation
Cost Buy-downs
Production Credits
Tax Policies
Climate Change Levies
Energy Efficient Mortgages
System Benefit Charges

Getting to the Transmission Wire

Opposing Approaches

Flexible and Supportive- ISO/RTO/Utility accommodates intermittent and unscheduled supply as part of an overall balancing function

Rigid and Could Care Less -ISO/RTO/Utility requires individual power block balancing and refuses supply not meeting rigid rules

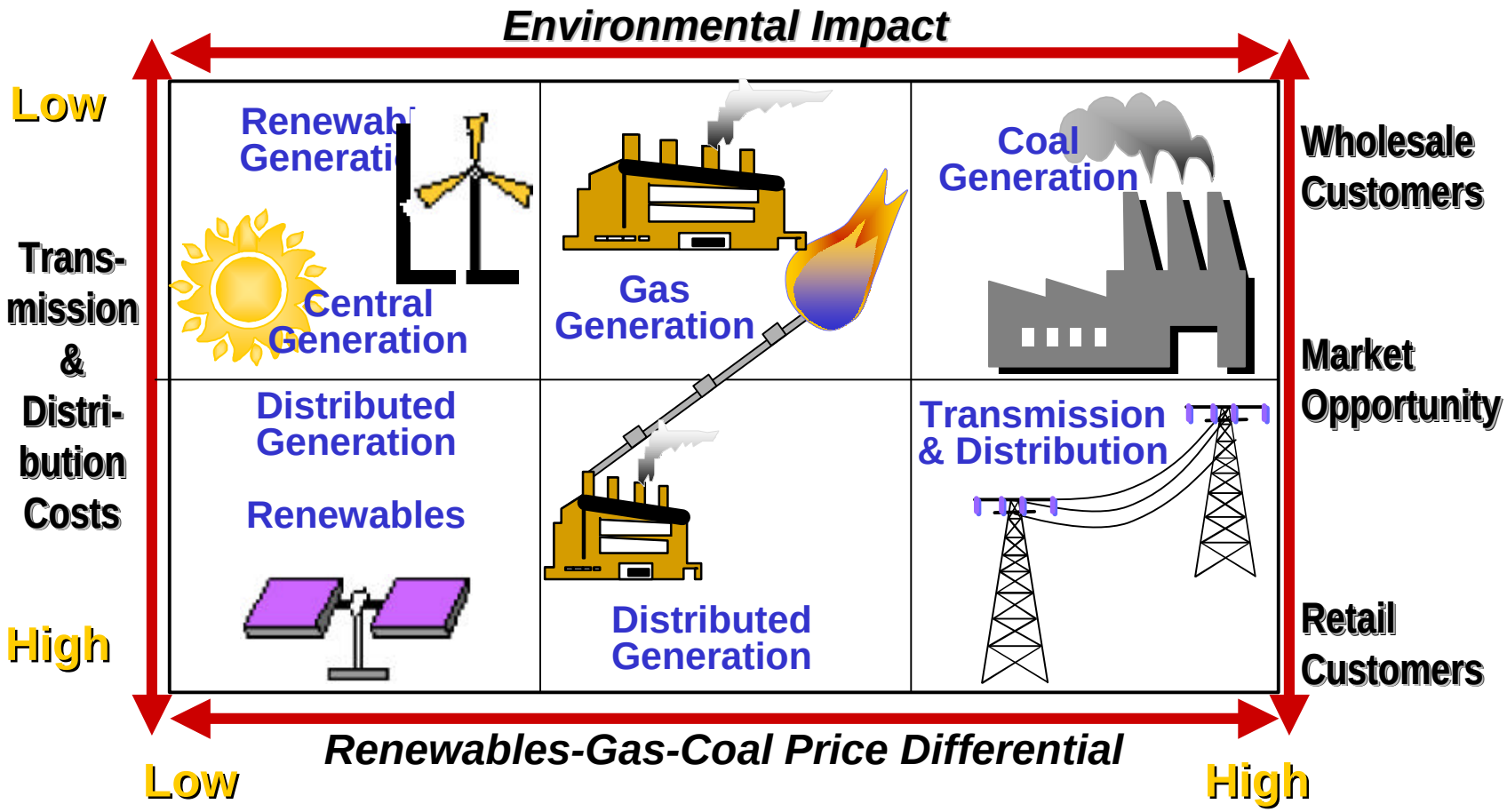
Getting to the Distribution Wire

Opposing approaches to nontechnical issues

Plug and Play - Distributed Generator meets all technical standards. Burden of proof that there is a problem rests with the Electrical Distribution Company

Hesitate and Hassle - Distributed Generator meets all technical standards. Burden of proof that there is no problem rests with the Generator

The Dynamics of the Industry



Adapted from National Power

Defining A Future System

A System that provides energy services that are

clean, sufficient, affordable and

tailored to "smart" efficient customers worldwide

Must have Innovation

System Design Tradeoff Considerations

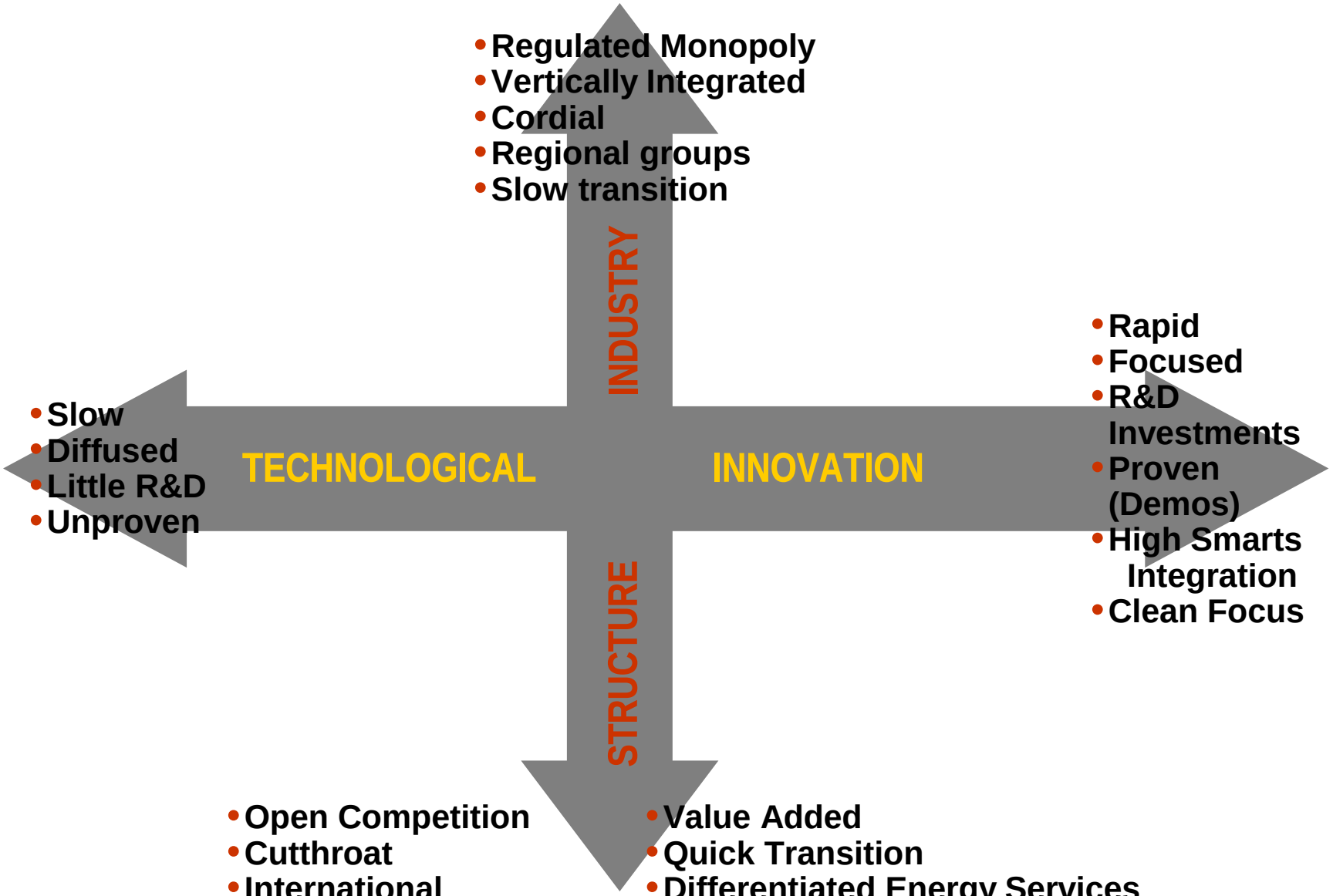
Regulated vs. Competitive

Clean vs. Dirty

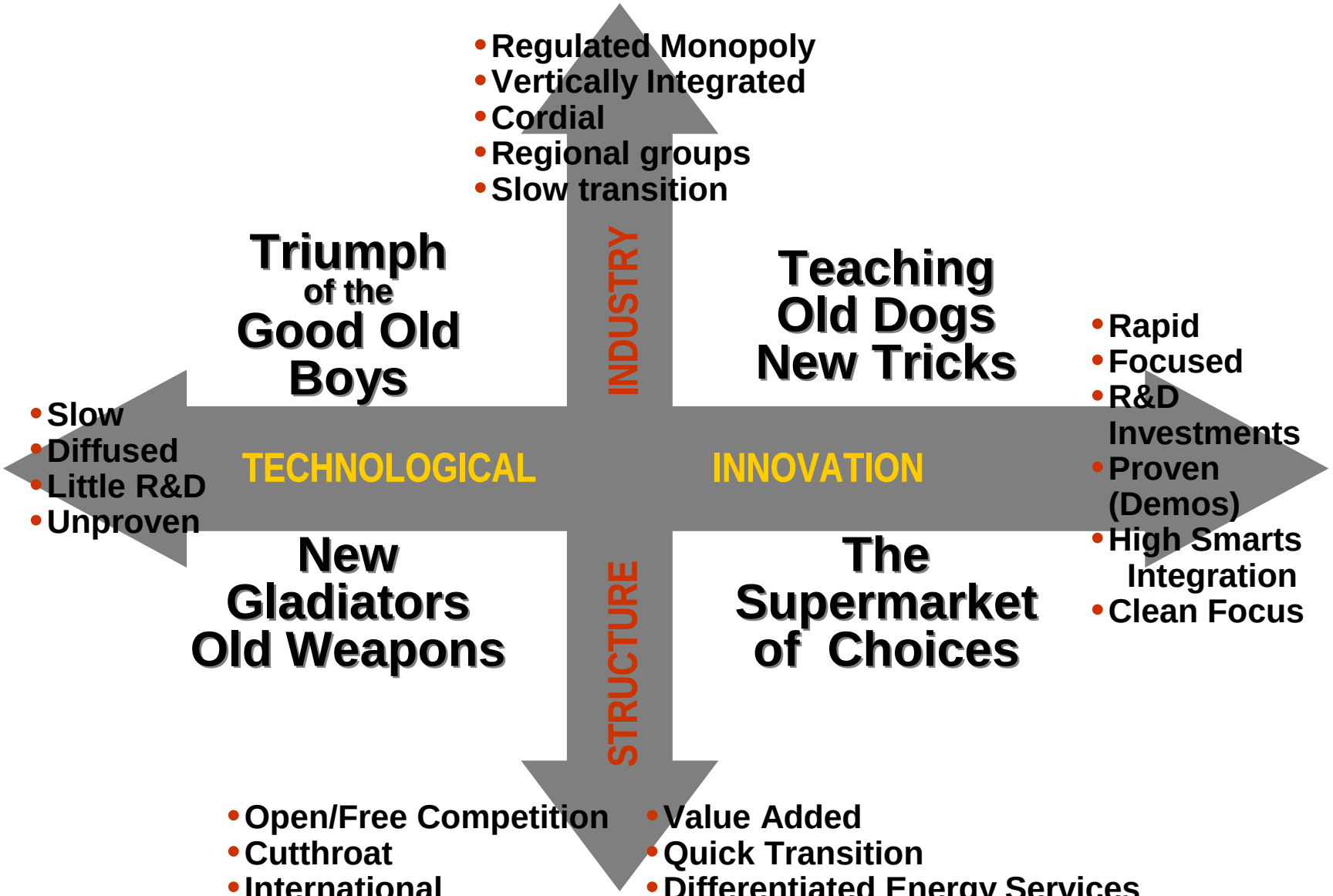
Central vs. Distributed,

Affordable vs. Expensive

Electrical Industry Scenarios



Electrical Industry Scenarios



Reconciling Strategies
Innovation or Tradition

- **Continue to Increase Renewables and Efficiency**
- **Ease access to the Transmission and Distribution Grid**

Where do we go from here ?

Innovation or tradition

We need to innovate and

need to learn to exist in both worlds

“Teaching Old Dogs New Tricks” and

“The Supermarket of Choices”

Governments Cannot Solve All the Problems

Markets do not have All the Solutions